

Name: _____

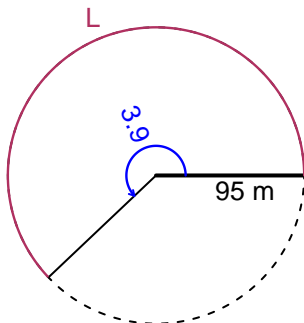
Date: _____

Trig Final (SLTN v665)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 95 meters. The angle measure is 3.9 radians. How long is the arc in meters?

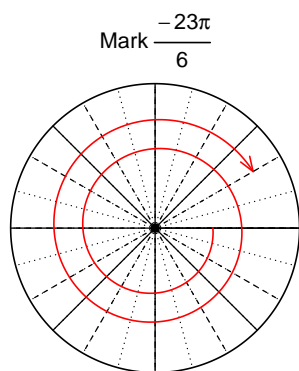


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 370.5$ meters.

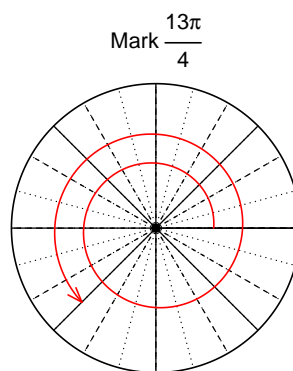
Question 2

Consider angles $-\frac{23\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(-\frac{23\pi}{6}\right)$ and $\sin\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-23\pi/6)$

$$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$$



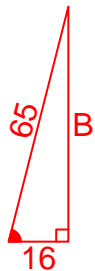
Find $\sin(13\pi/4)$

$$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$$

Question 3

If $\cos(\theta) = \frac{16}{65}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

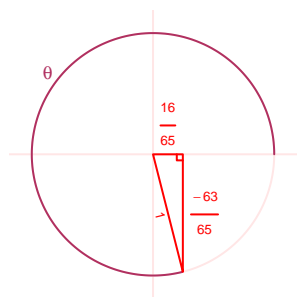
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}16^2 + B^2 &= 65^2 \\ B &= \sqrt{65^2 - 16^2} \\ B &= 63\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-63}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.26 Hz, an amplitude of 6.86 meters, and a midline at $y = 4.94$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.86 \cos(2\pi 3.26t) + 4.94$$

or

$$y = -6.86 \cos(6.52\pi t) + 4.94$$

or

$$y = -6.86 \cos(20.48t) + 4.94$$